

WHAT IS CLAIMED IS:

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1. A printing apparatus scanning a carriage mounting a printing head over a printing medium for a plurality of times, to perform printing upon respective scan and to perform feeding the printing medium for feeding the printing medium for a predetermined amount in a direction different from a scanning direction of said carriage between scans of plurality of times for printing on a printing medium, comprising:

means for getting information relating to a printing medium feeding period required for feeding the printing medium for the predetermined amount after completion of printing in a preceding line in a preceding scan;

means for setting a carriage scanning period required to printing start of the next line after completion of printing in said preceding line so as to be substantially equal to said printing medium feeding period depending upon printing completion position of the preceding line and the printing start position of the next line; and

means for driving said carriage to scan depending upon a period set by said carriage scanning period setting means.

2. A printing apparatus as claimed in claim 1, wherein said carriage scanning period includes at least a first carriage scanning period required for the carriage to

reach a predetermined position after completion of  
printing of the preceding line and a second carriage  
scanning period required for the carriage to reach the  
predetermined period at the printing start position of the  
5 next line,

said carriage scanning period setting means takes a  
difference between a said printing medium feeding period  
and a sum of said first carriage scanning period and said  
second carriage scanning period, as a waiting period when  
10 a sum of said first carriage scanning period and said second  
carriage scanning period is less than said printing medium  
feeding period,

said carriage driving means maintains stopping the  
carriage for said waiting period after deceleration and  
15 stop of the carriage according to said first carriage  
scanning period after completion of printing of the  
preceding line.

3. A printing apparatus as claimed in claim 1, wherein  
20 said carriage scanning period includes at least a first  
carriage scanning period required for the carriage to  
reach a predetermined position after completion of  
printing of the preceding line and a second carriage  
scanning period required for the carriage to reach the  
25 predetermined period at the printing start position of the  
next line,

said carriage scanning period setting means sets

scanning speed of said carriage so that a sum of said first carriage scanning period and said second carriage scanning period becomes equal to said printing medium feeding period, and

5        said carriage driving means drives carriage scanning  
depending upon scanning speed of the carriage set by said  
carriage scanning period setting means.

4. A printing apparatus scanning a carriage mounting a  
10 printing head over a printing medium for a plurality of  
times, to perform printing upon respective scan and to  
perform feeding of printing medium for feeding the  
printing medium for a predetermined amount in a direction  
different from a scanning direction of said carriage  
15 between scans of plurality of times for printing on the  
printing medium, comprising:

means for getting information relating to a printing medium feeding period required for feeding the printing medium for the predetermined amount after completion of printing in a preceding line in a preceding scan;

means for getting information relating to a carriage scanning period from end position of printing of the preceding line to start position of printing of next line in a scanning direction of the carriage; and

25 means for driving said carriage to scan to printing  
start of the next line after completion of printing in said  
preceding line depending upon a relationship between said

carriage scanning period and said printing medium feeding period.

5. A printing apparatus as claimed in claim 4, wherein  
5 said carriage driving means does not vary scanning speed of said carriage even after completion of printing of preceding line when said carriage scanning period is longer than said printing medium feeding period.

10 6. A printing apparatus as claimed in claim 4, wherein said carriage driving means provides a zone to stop the carriage for a predetermined period so that said carriage scanning period becomes equal to said printing medium feeding period when said carriage scanning period is less  
15 than said printing medium feeding period, and accelerates said carriage to reach the printing start position at a predetermined speed after decelerating said carriage to stop for the predetermined period after completion of printing of the preceding line.

20 7. A printing apparatus as claimed in claim 4, wherein said carriage driving means provides a zone to decelerate the carriage for a predetermined period so that said carriage scanning period becomes equal to said printing  
25 medium feeding period when said carriage scanning period is less than said printing medium feeding period, and accelerates said carriage to reach the printing start

position at a predetermined speed after scanning said carriage at decelerated speed after completion of printing of the preceding line.

5 8. A printing apparatus scanning a carriage mounting a printing head over a printing medium for a plurality of times, to perform printing upon respective scan in a predetermined direction, and to perform feeding the printing medium for feeding the printing medium for a  
10 predetermined amount in a direction different from a scanning direction of said carriage between scans of plurality of times in said predetermined direction for printing on the printing medium, comprising:

means for getting information relating to a printing  
15 medium feeding period required for feeding the printing medium for the predetermined amount after completion of printing in a preceding line in a preceding scan;

means for setting a carriage scanning period required to printing start of the next line after completion of  
20 printing in said preceding line in said preceding scan so as to be substantially equal to said printing medium feeding period depending upon printing completion position of the preceding line and the printing start position of the next line; and

25 means for driving said carriage to scan depending upon a period set by said carriage scanning period setting means.

claim 1  
does not  
have  
phrase  
in  
parenthesis

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9. A printing apparatus as claimed in claim 8, wherein  
said carriage scanning period includes at least a  
first carriage scanning period required for stopping the  
5 carriage at a predetermined position after completion of  
printing of the preceding line, a carriage return period  
required for effecting scanning in said predetermined  
direction and returning the carriage in reverse direction  
to stop at the predetermined position, and a second  
10 carriage scanning period required for the carriage to  
reach at the predetermined speed to the printing start  
position of the next line from a predetermined position  
stopping after carriage return,

said carriage scanning period setting means takes a  
15 difference between a sum of said first carriage scanning  
period and said carriage return period and said second  
carriage scanning period, and a printing medium feeding  
period as a waiting period when a sum of said first carriage  
scanning period and said carriage return period and said  
20 second carriage scanning period is less than said printing  
medium feeding period,

said carriage driving means maintains stopping the  
carriage for said waiting period after carriage return.

25 10. A printing apparatus scanning a carriage mounting a  
printing head over a printing medium for a plurality of  
times, to perform printing upon respective scan and to

perform feeding of printing medium for feeding the printing medium for a predetermined amount in a direction different from a scanning direction of said carriage between scans of plurality of times for performing printing on the printing medium, wherein a recovery process of the printing head at a predetermined position is performed per scan in a predetermined direction of said carriage, comprising:

means for getting information relating to a printing medium feeding period required for feeding the printing medium for the predetermined amount after completion of printing in a preceding line in a preceding scan;

means for setting a carriage scanning period required to printing start of the next line after completion of printing in said preceding line in a preceding scan so as to become <sup>substantially</sup> equal to said printing medium feeding period depending upon printing completion position of the preceding line and the printing start position of the next line; and

means for driving said carriage to scan depending upon a period set by said carriage scanning period setting means.

11. A printing apparatus as claimed in claim 10, wherein said carriage scanning period includes at least a first carriage scanning period required for the carriage to stop at a predetermined position after completion of

Claim 8  
has  
substantially

printing in a predetermined direction, a recovery process  
period required for performing recovery process of the  
printing head at the predetermined position and a second  
carriage scanning period required for the carriage to  
5 reach the printing start position of the next line by  
scanning the carriage in a direction opposite to scanning  
of said predetermined direction from said predetermined  
position after finishing of the recovery process,

10 said carriage scanning period setting means takes a  
difference between a sum of said first carriage scanning  
period, a recovery period and said second carriage  
scanning period, and said printing medium feeding period  
as a waiting period when a sum of said first carriage  
scanning period, said recovery period and said second  
15 carriage scanning period is less than said printing medium  
feeding period,

said carriage driving means stops the carriage for  
said waiting period after finishing said recovery process.

20 12. A printing apparatus as claimed in claim 10, wherein

said carriage scanning period includes at least a  
first carriage scanning period required for the carriage  
to stop at a predetermined position after completion of  
printing in a predetermined direction, a recovery process  
25 period required for performing recovery process of the  
printing head at the predetermined position and a second  
carriage scanning period required for the carriage to





medium for the predetermined amount after completion of printing in a preceding line in a preceding scan;

step of setting a carriage scanning period required to printing start of the next line after completion of printing in said preceding line so as to be substantially  
5 equal to said printing medium feeding period depending upon printing completion position of the preceding line and the printing start position of the next line; and

step of driving said carriage to travel depending upon  
10 a period set by said carriage scanning period setting step.

14. A carriage scan driving method as claimed in claim 13, wherein

said carriage scanning period includes at least a  
15 first carriage scanning period required for the carriage to reach a predetermined position after completion of printing of the preceding line and a second carriage scanning period required for the carriage to reach the predetermined period at the printing start position of the  
20 next line,

said carriage scanning period setting step takes a difference between a said printing medium feeding period and a sum of said first carriage scanning period and said second carriage scanning period, as a waiting period when  
25 a sum of said first carriage scanning period and said second carriage scanning period is less than said printing medium feeding period,

5 said carriage driving step maintains stopping the carriage for said waiting period after deceleration and stop of the carriage according to said first carriage scanning period after completion of printing of the preceding line.

10 15. A carriage scan driving method as claimed in claim 13, wherein said carriage scanning period includes at least a first carriage scanning period required for the carriage to reach a predetermined position after completion of printing of the preceding line and a second carriage scanning period required for the carriage to reach the predetermined period at the printing start position of the next line,

15 said carriage scanning period setting step sets scanning speed of said carriage so that a sum of said first carriage scanning period and said second carriage scanning period becomes equal to said printing medium feeding period, and

20 said carriage driving step controls carriage scanning depending upon scanning speed of the carriage set by said carriage scanning period setting step.

25 16. A carriage scan driving method using a printing apparatus scanning a carriage mounting a printing head over a printing medium for a plurality of times, to perform printing upon respective scan and to perform feeding of

printing medium for feeding the printing medium for a predetermined amount in a direction different from a scanning direction of said carriage between scans of plurality of times for printing on the printing medium, comprising:

step of getting information relating to a printing medium feeding period required for feeding the printing medium for the predetermined amount after completion of printing in a preceding line in a preceding scan;

step of getting information relating to a scanning period of the carriage from completion position of printing of the preceding line to start position of printing of next line in a scanning direction of the carriage; and

step of driving said carriage to scan to printing start of the next line after completion of printing in said preceding line depending upon a relationship between said carriage scanning period and said printing medium feeding period.

17. A carriage scan driving method as claimed in claim 16, wherein said carriage driving step does not vary scanning speed of said carriage even after completion of printing of preceding line when said carriage scanning period is longer than said printing medium feeding period.

18. A carriage scan driving method as claimed in claim

16, wherein said carriage driving step provides a zone to stop the carriage for a predetermined period so that said carriage scanning period becomes equal to said printing medium feeding period when said carriage scanning period is less than said printing medium feeding period, and accelerate said carriage to reach the printing start position at a predetermined speed after decelerating said carriage to stop for the predetermined period after completion of printing of the preceding line.

19. A carriage scan driving method as claimed in claim 16, wherein said carriage driving step provides a zone to decelerate the carriage for a predetermined period so that said carriage scanning period becomes equal to said printing medium feeding period when said carriage scanning period is less than said printing medium feeding period, and accelerate said carriage to reach the printing start position at a predetermined speed after scanning said carriage at decelerated speed after completion of printing of the preceding line.

20. A carriage scan driving method using a printing apparatus scanning a carriage mounting a printing head over a printing medium for a plurality of times, to perform printing upon respective scan in a predetermined direction, and to perform feeding of printing medium for feeding the printing medium for a predetermined amount in a direction

different from a scanning direction of said carriage between scans of plurality of times in said predetermined direction for printing on the printing medium, comprising:

5       step of getting information relating to a printing medium feeding period required for feeding the printing medium for the predetermined amount after completion of printing in a preceding line in a preceding scan;

10       step of setting a carriage scanning period required to printing start of the next line after completion of printing in said preceding line in said preceding scan so as to be substantially equal to said printing medium feeding period depending upon printing completion position of the preceding line and the printing start position of the next line; and

15       step of driving said carriage to scan depending upon a period set by said carriage scanning period setting step.

21. A carriage scan driving method as claimed in claim 20, wherein

20       said carriage scanning period includes at least a first carriage scanning period required for stopping the carriage at a predetermined position after completion of printing of the preceding line, a carriage return period required for effecting scanning in said predetermined direction and returning the carriage in reverse direction to stop at the predetermined position, and a second carriage scanning period required for the carriage to

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reach at the predetermined speed to the printing start position of the next line from a predetermined position stopping after carriage return,

5 said carriage scanning period setting step takes a difference between a sum of said first carriage scanning period and said carriage return period and said second carriage scanning period, and a printing medium feeding period as a waiting period when a sum of said first carriage scanning period and said carriage return period and said  
10 second carriage scanning period is less than said printing medium feeding period,

said carriage driving step maintains stopping the carriage for said waiting period after carriage return.

15 22. A carriage scan driving method using a printing apparatus scanning a carriage mounting a printing head over a printing medium for a plurality of times, to perform printing upon respective scan and to perform feeding of printing medium for feeding the printing medium for a  
20 predetermined amount in a direction different from a scanning direction of said carriage between scans of plurality of times for printing on the printing medium, wherein a recovery process of the printing head at a predetermined position is performed per scan in a  
25 predetermined direction of said carriage, comprising:

step of getting information relating to a printing medium feeding period required for feeding the printing

medium for the predetermined amount after completion of printing in a preceding line in a preceding scan;

5 step of setting a carriage scanning period required to printing start of the next line after completion of printing in said preceding line in a preceding scan so as to become equal to said printing medium feeding period depending upon printing completion position of the preceding line and the printing start position of the next line; and

10 step of driving said carriage to scan depending upon a period set by said carriage scanning period setting step.

23. A carriage scan driving method as claimed in claim 22, wherein

15 said carriage scanning period includes at least a first carriage scanning period required for the carriage to stop at a predetermined position after completion of printing in a predetermined direction, a recovery process period required for performing recovery process of the printing head at the predetermined position and a second  
20 carriage scanning period required for the carriage to reach the printing start position of the next line by scanning the carriage in a direction opposite to scanning of said predetermined direction from said predetermined  
25 position after finishing of the recovery process,

said carriage scanning period setting step takes said printing medium a difference between a sum of said first



carriage scanning period, a recovery period and said second carriage scanning period, and said printing medium feeding period as a waiting period when a sum of said first carriage scanning period, said recovery period and said second carriage scanning period is less than said printing medium feeding period,

said carriage driving step stops the carriage for said waiting period after said recovery process.

24. A carriage scan driving method as claimed in claim 22, wherein

said carriage scanning period includes at least a first carriage scanning period required for the carriage to stop at a predetermined position after completion of printing in a predetermined direction, a recovery process period required for performing recovery process of the printing head at the predetermined position and a second carriage scanning period required for the carriage to reach the printing start position of the next line by scanning the carriage in a direction opposite to scanning of said predetermined direction from said predetermined position after finishing of the recovery process,

said carriage scanning period setting step takes a difference between a sum of said first carriage scanning period, a recovery period and said second carriage scanning period, and said printing medium feeding period as a waiting period when a sum of said first carriage

scanning period, said recovery period and said second carriage scanning period is less than said printing medium feeding period,

5 said carriage driving step performs said recovery process after stopping the carriage for said waiting period.

10 25. A printing method performing printing on a printing medium with relative primary scan of a carriage mounting a printing head and a printing medium for a plurality of times, and with relative auxiliary scan of said printing medium and said carriage in a direction different from the direction of said primary scan, during intervals between said plurality of times of primary scan, the method  
15 comprising:

printing step of performing printing in a leading primary scan;

20 step of performing said auxiliary scan after completion of said printing step and before initiation of printing step in a following primary scan;

wherein

25 a period required for said primary scan from a printing completion position of a printing step in a said leading primary scan to a printing start position of a printing step in a next primary scan is substantially equal to a period required for said auxiliary scan.